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REVEGETATION OF A DENUDED AREA

H. S. CONARD

(WITH TWO FIGURES)

One-half mile west of Cold Spring Harbor station on the Long Island Railroad, extensive changes in the roadbed are in progress. In straightening, widening, and changing the grade of the road, the hillside has been cut away, and the materials so obtained have been dumped directly downhill from the cut to make a wide level shelf for the tracks. Where the new level crosses the old grade of the hillside, the soil was practically undisturbed and a curved line of vegetation has grown up from the old roots. On the side of this line toward the hill the earth is newly exposed. It has been buried since the glaciers left it. On the other side of the line, the ground consists of the material dug away from the adjacent hill by steam shovels and dumped at once or after a short haul in cars. The digging was done in March and April 1911. The material moved is coarse sand and fine gravel of the morainic hills of the north side of Long Island. The hillside faces south, and was clothed with a vegetation typical of such a dry, sunny situation in this region.

On the apparently denuded area, the prospective roadbed, many plants are already (July 1911) well developed. A study of the nature and origin of these has proven of interest and is here presented. Sixty species of angiosperms and one fern make up the present flora of the newly made shelf; 53 of these are now to be found growing on the hillside above the cut. Of the plants found both above and below, 39 are long-lived perennials. All of these except *Smilacina racemosa*[1] and *Desmodium canescens* were growing in the made ground from pieces of root, rhizome, or "crown" of old plants carried down from the hillside in the digging. The fragments had been tumbled in promiscuously with the earth, and those near enough the surface had sprouted. Thus we have a large experiment in the roughest kind of transplanting of 37 species during their resting period. The *Smilacina* and *Desmodium* mentioned above grew in the band of vegetation where the old hillside grade intersects the new level. They had not been transplanted, but were covered with about three inches of fresh sand.

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[1] The nomenclature of the new GRAY'S *Manual* has been followed.

Whether the transplants were roots or rhizomes is of but slight importance. So far as we could determine by surface inspection, root propagation is shown by the following:

Myrica Gale, M. asplenifolia (root 6 in. by $\frac{1}{2}$ in.), Sassafras variifolium (6 in. by $\frac{1}{4}$ in.), Rubus villosus (3 in. by $\frac{1}{6}$ in.), Robinia Pseudo-Acacia (4–6 in. by $\frac{1}{8}$ in.), Lespedeza fruticosa (?), L. repens, Euphorbia Ipecacuanhae, Rhus glabra (6–8 in. by $\frac{1}{2}$ in.), R. copallina (6 in. by $\frac{3}{16}$ in.), Vaccinium pennsylvanicum (4 in. by $\frac{1}{8}$ in.), Asclepias amplexicaulis (3 in. by $\frac{1}{2}$ in.).

Pieces of rhizome give rise to new plants in the following:

Pteris aquilina, Smilax glauca, S. rotundifolia, Aralia nudicaulis (14 in. by $\frac{1}{2}$ in.), Lespedeza virginica (?).

The entire plant or the crown with more or less of root had been moved down bodily in the following:

Andropogon scoparius, Panicum sp., Cyperus filiculmis, Stenophyllus capillaris, Carya alba (stump), Quercus marylandica (stump), Q. alba (stump), Rumex acetosella, Prunus serotina (stump), Baptisia tinctoria, Desmodium nudiflorum, D. rotundifolium, Stylosanthes biflora, Oxalis corniculata, Helianthemum canadense, Viola pedata, Thaspium aureum (?), Plantago major, Eupatorium hyssopifolium, Solidago altissima, S. odora (?), S. tenuifolia, Aster (2 spp. not identified), A. linariifolius, Sericocarpus asteroides, Achillea millefolium, Taraxacum officinale.

Seedlings of the following plants were found in the congenial sand of the new exposure, though no seedlings of *Myrica*, *Castanea*, *Baptisia*, or *Tephrosia* were seen on the hillside. The other species named, whose seedlings were found in both habitats, are nearly all annuals.

Myrica asplenifolia, Castanea dentata, Phytolocca decandra, Mollugo verticillata, Portulacca oleracea, Baptisia tinctoria, Tephrosia virginiana, Trichostema dichotoma, Linaria canadensis, and Ambrosia artemisiaefolia.

The following plants of the new ground were not found at all on the hillside:

Avena sativa, Polygonum hydropiper (?), P. convolvulus, Acalypha virginica, Oenothera biennis, Xanthium canadense (?).

These are such common weeds everywhere that their appearance causes no surprise. Nevertheless it would be interesting to know how they came in. *Avena*, of course, and perhaps others were brought by horses.

Turning to the hillside, we find 25 species[2] which are not yet represented on the new ground below. A few of these deserve notice. For example, a part of the hill is literally covered with *Gerardia pedicularia*, both rosettes and flowering plants. Why did none of these survive transplanting? Perhaps their parasitic habits are partly responsible. If so, the plant must be an obligate parasite, even if only hemiparasitic. *Deschampsia flexuosa* is much more plentiful on the hillside than *Andropogon*, but none of it

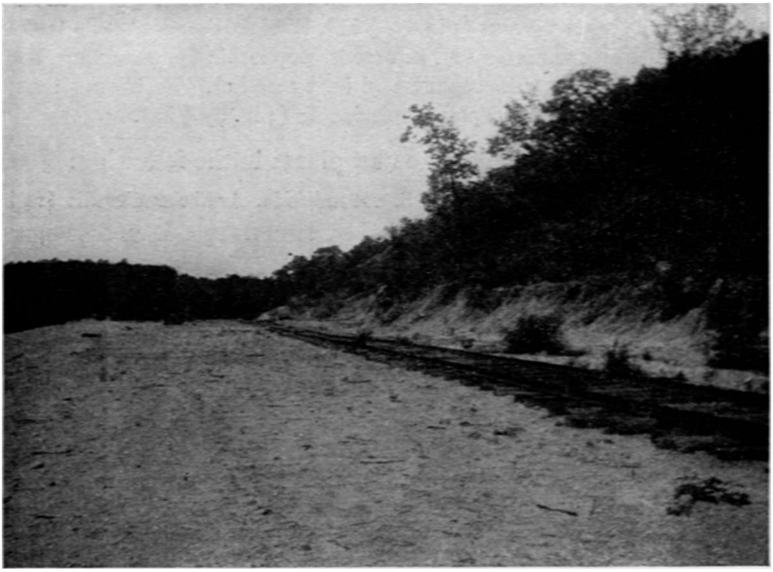

FIG. 1.—A wide level shelf for the track

appears below. The new exposure is very sunny, and therefore unfavorable to *Deschampsia*. Perhaps also its root system may not be disturbed without serious injury. Two species of *Lechea* and one of *Hieracium* (*H. venosum*) are the next most plentiful hillside plants which did not survive transplanting. We have no explanation for this. Large clumps of *Lupinus perennis* and *Tephrosia virginiana* occur at one part of the hill. It seems strange that no transplanted specimens were found. The remaining species of the hill were not numerous enough to give any large chance of their finding a possibility of survival on the new ground.

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[2] The plants found on the hillside but not below are Deschampsia flexuosa, Carex (2 spp.), Corylus americana, Quercus stellata, Amelanchier canadensis, Lupinus perennis, Linum virginianum, Acer rubrum, Psedera quinquefolia, Hypericum gentianoides, Lechea villosa, L. intermedia, Cornus sp., Chimaphila maculata, Gaylussacia baccata, Verbascum Thapsus, Gerardia pedicularia, G. flava, Chrysopsis mariana, Solidago bicolor, Antennaria neglecta, Erechtites hieracifolia, Hieracium venosum, and H. scabrum.

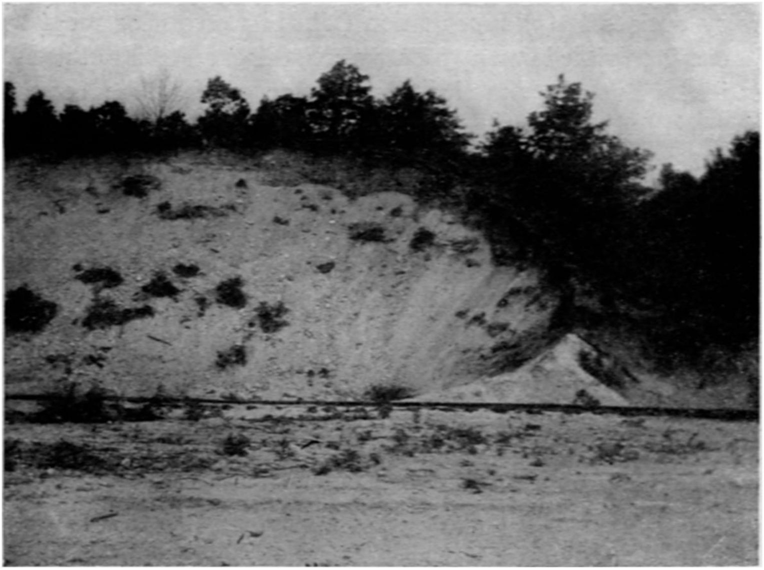

FIG. 2.—On the apparently denuded area many plants are already well developed

The meaning of this record is in several respects very clear. (1) An area denuded in winter or early spring receives few if any disseminules by any agency save that of man and domestic animals. Plants are not traveling at that season. (2) An apparently denuded area may contain viable fragments of a rather large flora. (3) If the disturbance occurs during the resting season of vegetation, new plants will arise from many fragments which would perish at any other season. For the resting plant contains nourishment to enable it to start new growth, and most perennials put out a whole new system of absorptive roots as well as a whole new foliage each year. The extent of the new root system is greater than many people suppose. (4) As a corollary to this it follows that most plants can be successfully transplanted, even by very rough methods, during the resting period. This is why I can get three good grape vines by mail in a package but little bigger than a lead pencil, and all of them grow vigorously. It is, indeed, the basis of the whole nursery business. (5) Propagation from bits of resting roots and rhizomes is possible in many plants where this method is not usually practiced. But the practice has become much more common commercially in the last ten years, owing to the keen observation of the best gardeners. It must be stated that in many cases of the transplants noted in this account, the new rootage seemed more meager than the production of shoots. Whether all of the sixty-one species will survive, or, in the terminology of CLEMENTS, whether their rather violent migration will be followed by ecesis, remains to be seen.

COLD SPRING HARBOR, L.I.